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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Yoram KAPULNIK, et al

Serial No.: 09/762,243

Filed: February 5, 2001

For: METHOD FOR SELECTIVE AND
OPTIONALLY REVERSIBLE...

Examiner: Anne R. Kubelik

Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313

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Group Art Unit: 1638

Attorney
Docket: 01/21632

DECLARATION OF PROFESSOR YORAM KAPULNIK UNDER
37 CFR 1.132

I am presently employed as researcher at the ARO, the Volcani Center, Department of Agronomy and Natural resources, where I am a full professor. I also serve as the Director of the Institute of Field and Garden Crops. I received my Ph.D degree from the Hebrew University of Jerusalem, worked as a post-doctoral fellow in University of California, Davis, and was a visiting Professor at Rutgers University, NJ, USA.

My research focuses on Molecular Biology, Plant Physiology and Microbiology. Since the beginning of my career, I have published more than 80 scientific articles in highly regarded journals and books, and have presented my achievements at many international scientific conferences.

I am a co-inventor of the subject matter claimed in the above-referenced U.S. patent application.

I have read the Official Action dated November 23, 2004, issued with respect to the above-identified application.

In this Official action, the Examiner has rejected claims 62 and 64-66 under 35 U.S.C. § 112, first paragraph, asserting that the specification does not reasonably

provide enablement for methods of using streptavidin-encoding constructs with a secretion signal sequence and any tissue specific or developmental specific promoter to transform plants.

In contrast to the Examiner's assertion, I believe that we have demonstrated the ability to affect specific, targeted degeneration of plant tissue using tissue specific expression of streptavidin, at a non-lethal level, in plants according to the methods and protocols of the present invention. While reducing the present invention to practice, the present inventors have shown that depletion of biotin in plant tissues by streptavidin-encoding constructs of the present invention effectively reduces the viability of specific plant tissues. Constitutive transient expression of the streptavidin in tomato plants, driven by the CaMV35S promoter, resulted in plants having extensive morphological and developmental deficiencies, from stems, to leaves to flower buds (see Table 3, page 47 of the specification), and strikingly modified canopy size, the effects of which could be reversed with external application of biotin (see Figures 5 and 7 of the specification).

I would like to point out that targeted transgenic expression of biotin-binding factors such as avidin and streptavidin in plants has recently been proposed as a means for agricultural pest control, the biotin binding factors being toxic to larvae and pests. In order to protect plant tissues from the biotin-binding effects of the transgenic avidin or streptavidin, in these studies the transgenic biotin binding factors are targeted to vacuoles using potato proteinase inhibitor signal peptide, resulting in high levels of transgene expression without disturbing the plant biotin metabolism (Burgess et al, Trans Res 2002;11:185-198; Kramer et al Nat. Biotech 2000;18:670-74; Marwick et al, Trans Res 2003;12:671-81; Murray et al, Trans Res 2002; 11:199-214).

While reducing the present invention to practice, we have shown that targeting and control of expression of streptavidin by the use of a tissue specific promoter results in degeneration of specific tissues: expression of the streptavidin transgene under control of the Tob promoter resulted in defective fruit and seed development (see Figure 8 of the specification).

Further investigation has reinforced these findings. First, another variety of tomato plant (*L. esculentum* var. MP1) transformed with the streptavidin-encoding

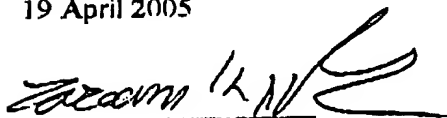
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construct of the present invention (*CaMV 35S:sp5*), under transcriptional control of the CMV35S promoter, was viable, but displayed signs of broadly-distributed tissue degeneration identical to those detected in the VF36 variety disclosed in the instant specification.

More importantly, we have shown that other, specific promoters can be employed to restrict streptavidin expression to a desired tissue. Expression of the streptavidin-encoding construct under transcriptional control of the embryo and endosperm-specific French bean β -phaseolin promoter resulted in deformed and non-viable seeds (see Figure 1), without affecting other plant organs. Thus, using the methods and constructs of the present invention, with any of the many tissue-and/or developmental specific plant promoters available would enable the specific alteration or degeneration of a wide variety of plant structures or developmental stages.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

19 April 2005



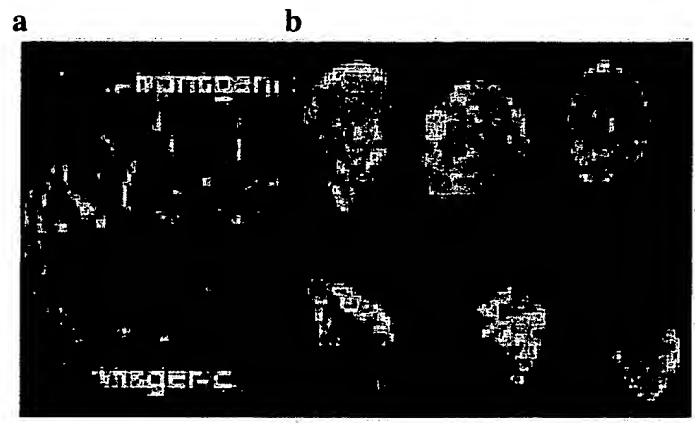
Prof. Yoram Kapulnik

Enc.:

Figure 1
CV of Prof. Kapulnik



Figure 1: Tissue specific expression of streptavidin in tomato transgenic plants.



The *sps* streptavidin gene was fused the French bean β -phaseolin promoter that directs endosperm- and embryo-specific expression (source: Karchi et al. 1994). Expression of the construct did not affect plant growth, flowering pattern or tomato fruit development throughout the entire growth cycle. However, tomato fruits expressing streptavidin under the control of the β -phaseolin promoter yielded a normal looking fruit matrix which, nevertheless contained deformed and non-viable seeds (Fig. 1b). Efforts to germinate the seeds on biotin-containing media did not restore the germination capacity (Fig. 1a).

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YORAM KAPULNIK

Feb. 2003

CURRICULUM VITAE

I. Personal

1954 Born March 1st, Hadera, Israel
1972 High-school education in "Tecshernihovsky", Netanya, Israel
1972-1975 Military service
Marital status: Married, 3 children

II. University Education and additional Training

1975-1978 B.Sc. in Agriculture at the Hebrew University of Jerusalem, Faculty of Agriculture, Rehovot, Israel.
1978-1980 M.Sc. Botany and Plant Pathology at the Hebrew University of Jerusalem. Title of thesis: Nitrogen fixation in *grass-Azospirillum* association.
Supervision by: Prof. Y. Okon and Prof. J. Kigel
1980-1984 Ph.D. Microbiology at the Hebrew University of Jerusalem Faculty of Agriculture, Department of Plant Pathology and Microbiology.
Title of thesis: Studies on the association between *Azospirillum* spp. bacteria and wheat plants.
Supervision by: Prof. Y. Henis and Prof. Y. Okon
1984-1986 Postdoctoral position at the University of California, Davis, Department of Agronomy and Range Science. Research subject: *Rhizobium*-legume symbiosis.
Supervision by: Prof. D.A. Phillips.
1991-1992 Sabbatical leave at the Center for Agricultural Molecular Biology, Rutgers University, New Jersey, USA, with Prof. I. Raskin.
Research subject: Alternative oxidase in plants' mitochondria
1995-1996 Sabbatical leave at Phytotech, Inc. Monmouth J. New Jersey, USA, with Dr. B. Ensley. Research subject: Phytoremediation of heavy metal from contaminated soils.

III. Positions Held and Academic Status

1980-1983 Research Associate and Teaching Assistant, Dept. of Microbiology, The Hebrew Univ., Faculty of Agriculture.
1984 Instructor in Microbiology, Dept. of Microbiology, The Hebrew Univ., Faculty of Agriculture.

1986-1987	Crop Physiologist, Davis, Department of Agronomy and Range Science, University of California.
1987-date	Research Scientist at the ARO, the Volcani Center, Institute of Field and Garden Crops.
1987	Promoted to Senior Scientist level B (equivalent to Senior Lecturer).
1991	Promoted to Senior Scientist level A (equivalent to Assoc. Prof.).
1997	Promoted to Senior Scientist level A + (equivalent to full Prof.).
1998-2001	Department head, Department of Agronomy and Natural Resources, Institute of Field and Garden Crops, ARO, The Volcani Center.
2001-date	Director, Institute of Field and Garden Crops, ARO, The Volcani Center.

IV. Teaching Experience

1988-date	"Plant root structure and function" Course No. 71956 at the Hebrew University of Jerusalem, Faculty of Agriculture, a graduate course.
1988-date	Lecture at the biannually course of the Ministry of Agriculture on Organic Farming.
1989-1990	Organizing the graduate students seminars in The Volcani Center (bi-monthly)
1994	"Root function". Extension specialists and research engineers course, Ministry of Agriculture, Bet Dagan, 40 hours.
1999-date	Mineral Nutrition lab Course No. 71936 at the Hebrew University of Jerusalem, Faculty of Agriculture, a graduate course.

Students : To date I have been responsible for overseeing the graduate work of 17 M.Sc., 7 Ph.D. and 8 Postdoctoral students.

V. Membership in Scientific and Agricultural committees

1986	Member, Organizing Committee of Finland-Israel Plant Microbe International Nitrogen Fixation Workshop.
1989-1991	Member, Israeli Committee for the review of research proposals to BARD (US-Israel Binational Agriculture Research and Development Foundation).

1989-1995	Member of the steering committee for research on Organic Agriculture of the Agricultural Research Organization.
1990-1991	Member, Organizing Committee of the First International Symbiosis Congress held in Jerusalem, November 1991
1990-1991	Member of the steering committee for research on use of saline water in agriculture of the Agricultural Research Organization.
1990-1992	Member of the Academic Committee of the Agricultural Research Organization.
1993-1995	Member, Israeli Committee for the review of research proposals to BARD (US-Israel Binational Agriculture Research and Development Foundation).
1993-1994	Member of Inter-Ministerial special committee. Appointed by the General Director of the Ministry of Science for "MANOF" program to evaluate and follow-up research activity in periphery research centers.
1995-1996	Member of the National Environmental Protection Committee for defining objectives and reviewing research proposals for the Ministry of Science.
1997-date	Member of the ARO special committee for the usage of scientific intellectual properties.
1997-2001	Member of the National Committee for Transgenic Plants and Genetically Modified Organisms.
1999-2002	Member of the Technical assistant committee (TAC) of the US-Israel Binational Agriculture Research and Development Foundation (BARD).
2000-2002	Member of the Fulbright post-doc scholarship committee (US-Israel Educational Development Foundation).

VI. Editorial Responsibilities

Reviewer of manuscripts for various scientific journals including Biology and Fertility of Soil, Can. J. Botany, Israel Journal of Botany, Plant and Soil, Plant Physiology, Soil Biology and Biochemistry, Mol. Plant Microbe Inter., New Phytologist, Symbiosis.

VIII. Invited lectures at International Meetings

(Participating in meetings in which lecture was not given are not included)

- 1983 Azospirillum Workshop, Bayreuth, Germany September 1983. Invited lecture.
- 1987 Symposium on Plant Microbe Interactions. The Second Otto Warburg Symposium, Rehovot 12-14 February.
- 1988 Finland-Israel Binational Symposium. Nitrogen Fixation in Symbiotic Systems Jerusalem 28 Feb. - 1 March.
- 1989 The Second Finland-Israel Binational Symposium on Plant- Microbe-Interactions Helsinki 14-15th August.
- 1990 Root-Soil Workshop, Ithaca, NY, January 9-11, USA.
- 1990 Invited lecture in the Department of Plant Physiology, Hohenheim University, Germany, February.
- 1990 Spanish Israeli Workshop on Biotechnology, Ma'ale Hachamisha, May 14-15, Israel.
- 1990 Hungary-Israel Plant molecular Biology Workshop, Szeged, Aug 12-19 , Hungary.
- 1991 The first International Symbiosis Congress, Jerusalem, November 17-22, Israel.
- 1993 Israel-Brasil Symposium on Agricultural Biotechnology, February, Jerusalem, Israel,
- 1993 Plant Signals in Interactions with Other Organisms. Eight Annual Penn State Symposium in Plant Physiology, May 20-22, USA.
- 1993 Formosa Plastics Corporation, Agric/Environmental Research Center, South, La Ward, Texas, USA.
- 1994 Host-parasite interactions - A Multisystem Approach, Sixth G.I.F. meeting, Ernst-Moritz-Arndt-University of Greifswald, May 29 - June 2.
- 1994 First European Nitrogen Fixation Meeting, Szeged, August 29-Sept. 5, Hungary.
- 1994 Fallen Leaf Lake Conference, South Lake Tahoe, California Sept. 18-21, USA.
- 1995 Israeli-Hungarian Conference, Plant and Environment, Rehovot, March 20-23, Israel.
- 1995 Molecular Approaches to the Study of Plant-Microbe Symbioses. York 13-15, November. U.K.
- 1996 Phytoremediation, Second International Meeting, May 8-10, Washington, D.C., U.S.A.
- 1996 Annual International Meeting of the Society for Engineering in Agricultural, Food, and Biological Systems. July 14-18, Phoenix Arizona, USA.
- 1996 ICOM 1, First International Conference on Mycorrhizae, August 4-9, Berkeley, California, U.S.A.

- 1997 The Second International Symbiosis Congress, Woods Hole, USA
- 1998 Davis, Ca. Signal Perception in Biology Special Conference, UC Davis, Ca.
April 12-18, USA.
- 1999 COST Action Meeting: gene expression in arbuscular mycorrhizas, Torino, Villa
Gualino 22-24 May, Italy
- 2001 IX International Congress on Plant Tissue and Cell Culture Congress, Jerusalem,
June 14-19. Israel.
- 1998 IMC6, Sixth international Mycological Congress, Jerusalem, June 14-19.
- 1999 OBC workshop in Bonn University, Nov. 4-7, Germany.
- 2000 Mini-symposia on "Sustainable Agriculture" University of Wean, September 3-6.
- 2001 COST 8.38 action Adana, Turkey
- 2001 COST 8.38 action Pruhonice, Czech Republic, September 26-29
- 2002 COST 8.30 Microbial inoculants in Agriculture and Environment, Budapest, Hungary –
June 21-22.
- 2002 9th International Symposium on Nitrogen Fixation with Non-legumes.
September 1-5 Leuren, Belgium.
- 2002 COST action 8.38. Managing Arbuscular Mycorrhizal Fungi, October 10-12, Pisa, Italy.
- 2002 Application of AM fungi, Toulouse October 15-20, France.
- 2003 MPMI st. Petersburg
- 2003 Symbiosis, Halifax Canada
- 2003 Biotechnology: leading for GM crops. Romania
- 2003 COST 8.30 Cyprus
- 2004 COST action 8.30 October 21-23 at the CSIC in Granada, Spain
- 2004 France-Israel Agro-Biotechnologies workshop, December 6- 8 Toulouse, France

XII. Research Grants:

A. International Competitive Grants

- 1988-1991 BARD project: Enhancing Nitrogen Fixation and Alfalfa Forage Production In
Saline Environment. Principal Investigator, for 3 years,
Budget: Total: \$ 220,000; Researcher's part \$120,000.

1988-1991	GIF project: The Effect of Flavonoids on Legume Inoculation under Saline Conditions. Principal Investigator, for 3 years. Budget: Total: DM 280,000; Researcher's part DM 150,000.
1990-1993	BARD project: Utilization Plant Signals for Culturing VA mycorrhizal fungi. Cooperating Investigator, for 3 years. Budget: Total: \$ 250,000; Researcher's part \$ 130,000.
1992-1995	GIF project Improvement of Agricultural cultivars of Alfalfa by Introduction of Bacterial genes of Economic Importance. Cooperating Investigator, for 3 years. Budget: Total: \$ 250,000; Researcher's part \$ 50,000
1994-1995	BARD feasibility study: Isoflavonoid Regulation of Root Bacteria. Principal Investigator, for 3 years. Budget: Total \$ 100,000; researcher's part \$ 50,000.
1995-1998	CDR-AID project: Toward Increasing Tolerance of Forage Legumes to Salinity and Drought. Cooperating Investigator, for 3 years. Budget: Total \$ 187,000; researcher's part \$ 35,000.
1995-1998	BARD project : Isoflavonoleds Regulation of Root Bacteria. Principal Investigator, for 3 years. Budget: Total \$ 300,000; researcher's part \$ 155,000.
1996-1999	GIF project: Host Defense Response During the Establishment of Symbiotic Microorganisms in Alfalfa Rhizosphere. Principal Investigator, for 3 years. Budget: Total DM 300,000; researcher's part DM 155,000.
1999-2003	Israel-California Budget: Total: \$ 400,000; researcher's part \$ 180,000.

Additional Grants: In addition to the abovementioned International grants, I have been the recipient of numerous research grants from Israeli governmental and private sources.

IX. Membership in professional societies:

American Society of Plant Physiologists

Israel Society for Microbiology

International Society for Molecular Plant-Microbe Interactions

Academic Awards:

1984 – 1987 Fulbright Fellow

1984 – 1985 Rothschild Postdoctoral fellow

1986 - 1987 BARD Postdoctoral fellow

1989 "Hirsch Prize" of the Israel Society for Microbiology for Outstanding
Young Researcher.

1999 "Researcher of the year" of the Agricultural Research Organization, the
Volcani Center, Israel

LIST OF PUBLICATIONS

"All publications have been classified into five major categories: The letter following each number indicates the appropriate category.

- a. Publications exclusively within the candidate's research group (including graduate and post-graduate students, technicians, associate scientists, etc.).
- b. Joint publications with other research group(s) in which the candidate plays the major role.
- c. Joint publications with other research group(s) in which the candidate's contribution is of comparable weight to that (those) of other research groups.
- d. Joint publications with other research group(s) in which the candidate's group plays a secondary role.
- e. Joint publications with other research group(s) for which the candidate is incapable of estimating the relative weight of his/her contribution."
- * Author, which is a student under my guidance

PUBLICATIONS (reviewed)

Ph.D.

Kapulnik, Y. (1984).

Studies on the association between *Azospirillum* spp. bacteria and wheat plants. Ph.D. thesis submitted to the Hebrew University. Under the supervision of Prof. Y. Okon and Prof. Y. Henis of the Department of Plant Pathology and Microbiology, Faculty of Agriculture.

- 1. a. **Kapulnik, Y., Sarig, S., Nur, I., Okon, Y., Kigel, J., and Y. Henis. (1981).**
Yield increases in summer cereal crops in Israel fields inoculated with *Azospirillum*.
Experimental Agriculture 17:179-187, 0.29 (39/55).
- 2. a. **Kapulnik, Y., Okon, Y., Kigel, J., Nur, I. and Y. Henis. (1981).**
Effects of temperature, nitrogen fertilization and plant age on nitrogen fixation by *Setaria italica* inoculated with *Azospirillum brasilense* (strain Cd).
Plant Physiology 68: 340-343, 5.10 (6/136).
- 3. a. **Kapulnik, Y., Kigel, J., Okon, Y., Nur, I. and Y. Henis (1981).**
Effect of *Azospirillum* inoculation on some growth parameters and N-content of wheat, sorghum and *Panicum*.
Plant and Soil 61:65-70, 1.23 (48/136).
- 4. a. **Kapulnik, Y., Sarig, S., Nur, I., Okon, Y. and Y. Henis. (1982).**
The effect of *Azospirillum* inoculation on growth and yield of corn.
Isr J Botany 31:246-255, 0.58.

5. a. **Kapulnik, Y., Sarig, I., S., Nur, I. and Y. Okon. (1983).**
Effect of *Azospirillum* inoculation on yield of field grown wheat.
Can. J. Microbiol. 29:895-899. 1.07 (224/308).
6. b. Sarig, S., **Kapulnik, Y., Nur, I. and Y. Okon (1984).**
Response of non-irrigated *Sorghum bicolor* to *Azospirillum* inoculation.
Exp. Agric. 20: 59-66, 0.29 (39/55).
7. a. **Kapulnik, Y., and Y. Okon. (1984).**
Benefits of *Azospirillum* inoculation on wheat: Effects of root development, mineral uptake, nitrogen fixation and crop yield. In *Azospirillum: Genetics, Physiology, Ecology*. W. Klingmuller (Ed), Birkhauser Verlag Basel-Boston-Stuttgart Experientia Supplementum vol: 48 pp.163-170.
8. b. Yahalom, E., **Kapulnik, Y. and Y. Okon. (1984).**
Response of *Setaria italica* to inoculation with *Azospirillum brasilense* as compared to *Azotobacter chroococcum*.
Plant Soil 82: 77-85, 1.23 (48/136).
9. a. **Kapulnik, Y., Gafny, R. and Y. Okon. (1985).**
Effect of *Azospirillum* inoculation on root development and NO_3^- uptake in wheat (*Triticum aestivum* L. cv. Miriam) in hydroponic systems.
Can. J. Botany 63:627-631.
10. a. **Kapulnik, Y., Feldman, M., Okon, Y. and Y. Henis. (1985).**
Contribution of nitrogen fixed by *Azospirillum* to the N nutrition of spring wheat in Israel.
Soil Biol Biochem. 17:509-515, 1.76 (3/49).
11. a. **Kapulnik, Y., Okon, Y. and Y. Henis. (1985).**
Changes in root morphology of wheat caused by *Azospirillum* inoculation.
Can. J. Microbiol. 31: 881-887, 1.07 (224/308).
12. b. Cunningham, S. D., **Kapulnik, Y., Brewin, N. J. and D. A. Phillips. (1985).**
Uptake hydrogenase activity determined by plasmid pRL6JI in *Rhizobium leguminosarum* does not increase symbiotic nitrogen fixation.
Appl. Environ. Microbiol. 50: 791-794, 3.69 (18/101).
13. b. Sarig, S., **Kapulnik, Y. and Y. Okon. (1986).**
Effect of *Azospirillum* inoculation on nitrogen fixation and growth of several winter legumes.
Plant and Soil 90: 335-342, 1.23 (48/136).
14. b. Okon, Y., **Kapulnik, Y. and S. Sarig. (1986).**
Nitrogen fixation in grasses by *Azospirillum* In: Gottingen-Jerusalem Symposium in plant soil interactions (Oct.1982). B. Meyer and B. Ulrich (Eds.) Gottingen Bodenkundliche Berichte 85:176-193.

15. c. Gafny, R., Okon, Y., **Kapulnik, Y.** and M. Fischer (1986).
Adsorption of *Azospirillum* to corn roots.
Soil Biol. Biochem. 18: 69-75, 1.76 (3/49).
16. a. **Kapulnik, Y.**, Teuber, L.R. and D.A. Phillips. (1986).
Seedling development as a component of increased yield in an improved alfalfa population.
Crop Science 26: 770-775, 0.81 (15/55).
17. a. **Kapulnik, Y.** and D. A. Phillips. (1986).
Sodium stimulation of uptake hydrogenase activity in symbiotic *Rhizobium*.
Plant Physiol. 82: 494-498, 1.33 (43/136).
18. a. Cunningham, S.D., **Kapulnik, Y.** and D.A. Phillips. (1988).
Distribution of hydrogen-metabolizing bacteria in the soil of an alfalfa field.
Appl. Environ. Microbiol 52:1091-1095, 3.69 (18/101).
19. a. **Kapulnik, Y.**, Okon, Y. and Y. Henis. (1987).
Yield response of spring wheat cultivars to inoculation with *Azospirillum brasilense* under field conditions.
Biology and Fertility of Soils. 4: 2735-2740, 1.09 (10/29).
20. a. **Kapulnik, Y.**, Joseph, C.M. and D.A. Phillips. (1987).
Flavone limitations to root nodulation and Rhizobial nitrogen fixation in Alfalfa.
Plant Physiol. 84:1193-1196, 1.33 (43/136).
21. a. **Kapulnik, Y.**, Teuber, L.R. and D.A. Phillips (1989).
Lucerne (*Medicago sativa* L.) selected for vigor in nonsaline environment maintained growth under salt stress.
Australian J. of Agricultural Research 40:1253-1259.
22. b. Phillips, D.A., **Kapulnik, Y.**, Bedmar, E.J. and C.M. Joseph. (1990).
Development and partial characterization of nearly isogenic lines (*Pisum sativum* L.) that alter uptake hydrogenase activity in symbiotic *Rhizobium*
Plant Physiol. 92: 983-989. 1.33 (43/136).
23. a. Patterson, N.A. *, Chet, I. and **Y. Kapulnik.** (1990).
Effect of mycorrhizal inoculation on nodule initiation, activity and contribution of legume productivity.
Symbiosis 8: 9-20, 0.63 (82/101).
24. a. **Kapulnik, Y.** and B. Heuer. (1991).
Forage production of four alfalfa (*Medicago sativa* L.) cultivars under salinity growth conditions.
Arid Soil Research and Rehabilitation 5:127-135, 0.33 (22/29).

25. a. Patterson, N.A.*, Wininger, S., Badani, H. and **Y. Kapulnik**. (1991).
N₂-fixation activity and nitrate concentration do not affect *Glomus macrocarpum*
infection of *Medicago sativa* L.
Soil Biol Biochem. 23:703-705, 1.76 (3/49).

26. a. **Kapulnik, Y.** and U. Kushnir. (1991).
Growth dependency of wild, primitive and modern cultivated wheat lines on
vesicular-arbuscular mycorrhiza fungi.
Euphytica 56:27-36, 0.77 (16/55).

27. a. **Kapulnik, Y.** (1991).
Possible influence of soil structure on *Rhizobium* competition in legume -
Rhizobium symbiosis.
J of Plant Nutrition 15:821-834, 0.58.

28. b. Shore, L., **Kapulnik, Y.**, Wininger, S., Friedman, Y. and M. Shemesh. (1992).
The effect of estrone and IBS-estradiol on vegetative growth *Medicago sativa*.
Physiol. Plant 84:217-222, 1.76 (30/146).

29. a. **Kapulnik, Y.**, Yalpani, N. and I. Raskin. (1992).
Salicylic acid induces cyanide-resistant respiration in tobacco cell-suspension
cultures. *Plant Physiol.* 100:1921-1926, 5.10 (6/136).

30. c. Sitrit Y. *, Barak, Z., **Kapulnik, Y.**, Oppenheim, A. and I. Chet. (1993).
Expression of *Serratia marcescens* chitinase gene in *Rhizobium meliloti* during symbiosis
on alfalfa roots.
Molec. Plant Microb. Inter. 6:293-298, 3.86 (8/136).

31. c. Itzigsohn, R. *, **Kapulnik, Y.**, Okon, Y. and A. Dovrat. (1993).
Physiological and morphological aspects of the interactions between *Rhizobium*
meliloti and alfalfa (*Medicago sativa*) in association with *Azospirillum brasilense*.
Can. J. Microbiol. 39:610-615. 1.07 (224/308).

32. a. Volpin H. *, Elkind, Y., Okon, Y. and **Y. Kapulnik** (1994). A vesicular-arbuscular
mycorrhizal fungi induces a pathogenic defense response in alfalfa roots.
Plant Physiol 104:683-689. 5.10 (6/136).

33. a. **Kapulnik, Y.**, B., Heuer, N. A., Patterson*, D., Sadan, Z., Bar and G. Nir. (1994).
Stunting syndrome in field grown peanuts can be relieved by VA mycorrhizal fungi and zinc
nutrition.
Symbiosis. 16:267-278, 0.63 (82/101)

- 34.c. Firon, N., **Kapulnik, Y.** and S. Itzhar (1994).
Use of compound-S for flowering enhancement in crop plants. Classified
publication, ARO, The Volcani center, Bet Dagan.

- 35.a. Heuer, B., Schaffer, A., Meiri, A., Badani B., Ben-Dor B., Fogelman, M. and **Y. Kapulnik**, (1994).
Irrigation regimes and their effects on peanut seed quality.
J. Agronomy 3:169-174, 0.88 (14/55).
36. b. Shore, L., **Kapulnik, Y.**, Gurevich, M., Wininger, S., Badani, H. and M. Shemesh (1994).
Induction of phytoestrogen in *Medicago sativa* leaves by irrigation with sewage water..
Environ. and Exp. Botany. 35:363-369, 0.99 (57/134).
37. a. Volpin H. *, Phillips, D. A. Okon, Y. and **Y. Kapulnik**. (1995).
Suppression of an isoflavonoid phytoalexin defense response in mycorrhizal alfalfa roots.
Plant Physiol 108:1449-1454. 5.10 (6/136)
38. a. Shaul, O. *, Elad, Y., Galili, S., Volpin, H. *, Itzhaki, H. and **Y. Kapulnik**. (1995).
Peroxidase and pathogenicity-related proteins in plant tissues infected by *Botrytis cinerea*.
Aspects App. Biol. 42: 285-291.
39. a. **Kapulnik, Y.**, Volpin, H. *, Itzhaki, H., Ganon, D. *, Galili, S., David, R. *, Shaul, O. *, Elad, Y., Chet, I. and Y. Okon. (1996).
Suppression of defence responses in mycorrhizal alfalfa and tobacco roots.
New Phytol. 133:59-64. 2.53 (15/136).
40. c. Burdman S. *, Volpin, H. *, Kigel, J., **Kapulnik, Y.** and Y. Okon (1996).
Promotion of *nod-gene* inducers and nodulation in common bean (*Phaseolus vulgaris*) roots inoculated with *Azospirillum brasilense* Cd.
Appl. Environ. Microbiology 62:3030-3033. 3.69 (18/101).
41. b. Volpin, H. *, Burdman, S. *, Castro-Sowinski S., **Kapulnik, Y.** and Y. Okon (1996).
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